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MEANS FOR DYNAMICALLY BALANCING CYLINDERS

Filed Dec. 21, 1943

2 Sheets-Sheet 1

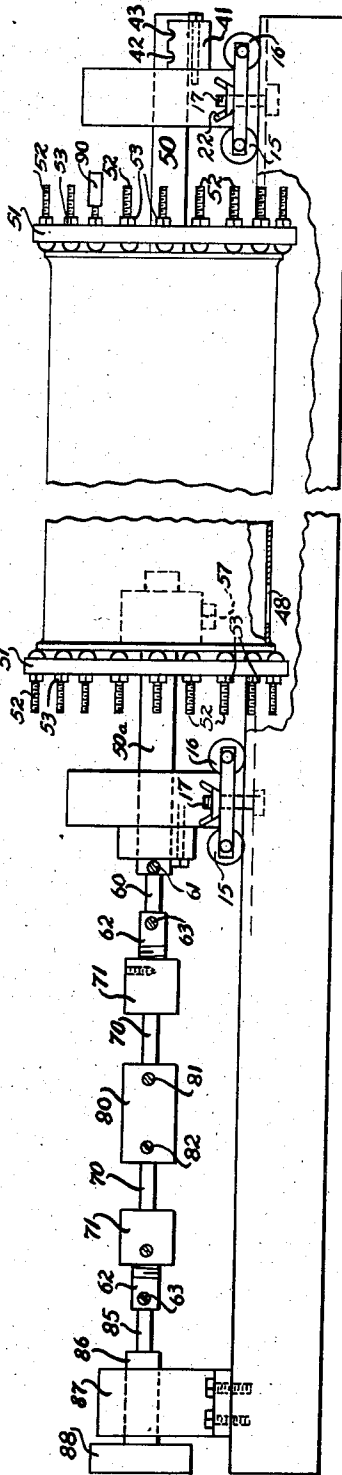


Fig-1

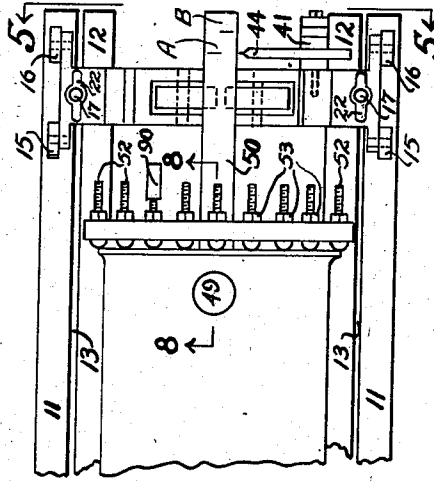


Fig-2

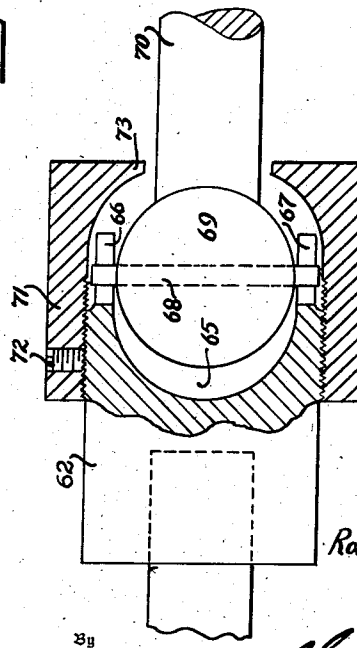


Fig-3

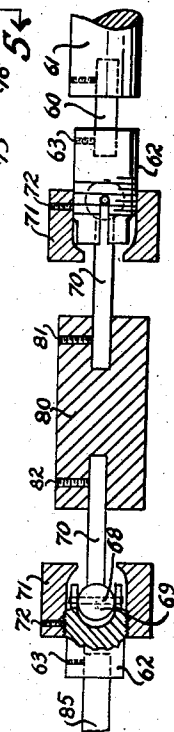


Fig-4

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2 Sheets-Sheet 2

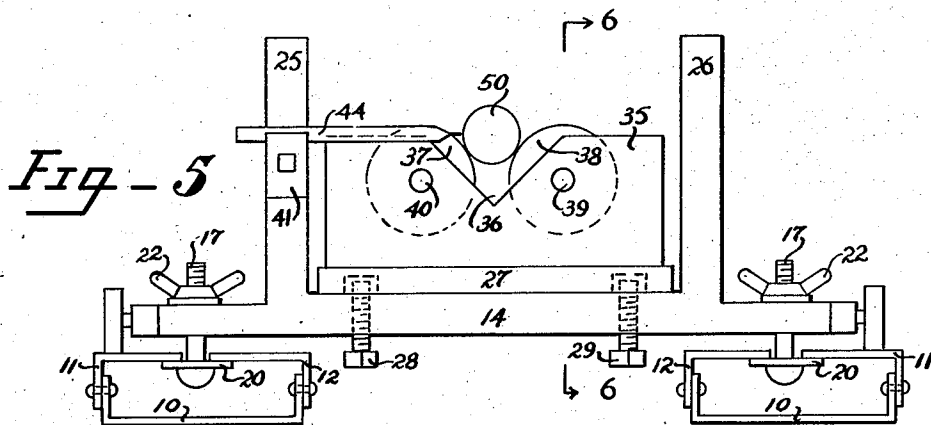
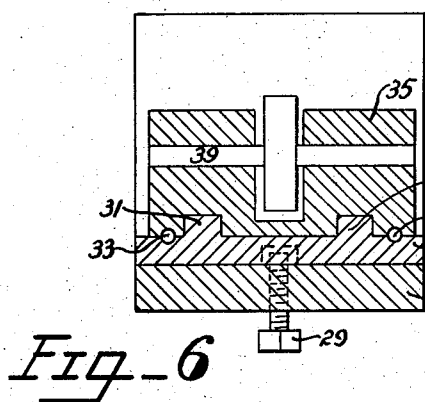
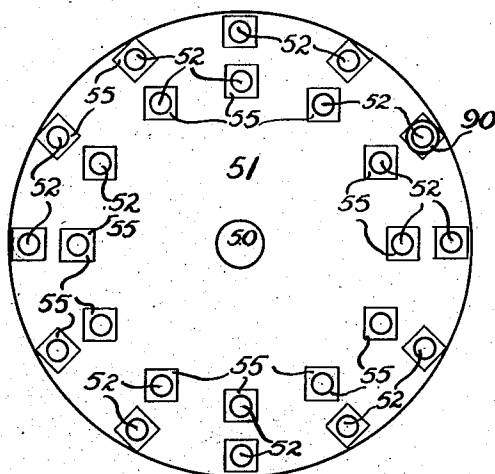
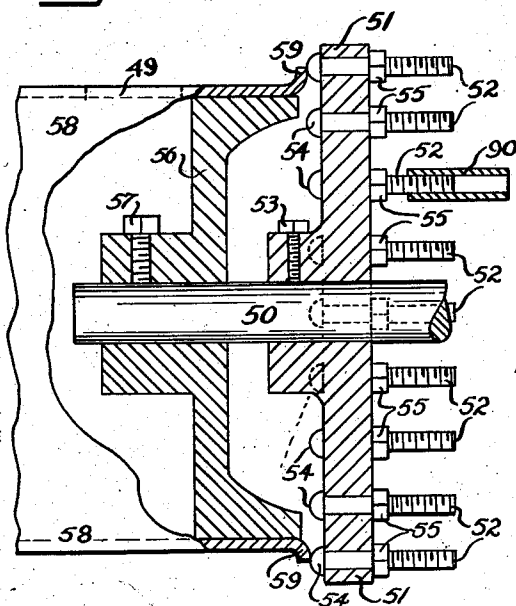


Fig-7

Fig-8

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MEANS FOR DYNAMICALLY BALANCING CYLINDERS

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2 Claims. (Cl. 73-66)

This invention relates to an apparatus for dynamically balancing elongated cylindrical objects such as sections of the cylinder for a spinning and twisting frame, spoolers, quillers, and the like where static balancing has not been found to be practical on account of the longitudinal or elongated dimensions of the sections of cylinders.

In a spinning frame, twisting frame, spooler, twister, and the like, it is well known that these textile machines are sometimes forty or more feet in length. They usually have suitable spindles on each side of the frame with a longitudinally disposed cylinder extending between the spindles from end to end and onto which belt or tapes are disposed, which belts are also disposed on the whorls of the spindles for imparting rotation to the same. These cylinders in the above-mentioned textile machines are usually made up in sections, a forty foot cylinder, probably being made up in sections of from five to fifteen feet in length. These sections of cylinders have flanges at each end and have a head member counter-shrunk therein, so that stub shafts can be disposed between the abutting ends of the cylinders and by means of a spanner wrench passed through a hole in the cylinders, the stub shafts can be secured in position to hold the cylinder as an entire section extending from one end of the frame to the other.

It very often happens that these cylinders are out of balance and are heavier on one side than the other, and this results in vibration while rotating, rapid wearing of bearings, and other defective results. Heretofore, it has been customary to endeavor to statically balance these cylinder sections by placing them on suitable bearings at each end thereof, and determine as to where the heavy spots or light spots in the periphery of the cylinders might be. Due to the length of these cylinder sections, if it were balanced by placing the weight such as solder and the like on the interior of one end of the cylinder, it would still remain unbalanced as the separated ends of the cylinders could not be tested as for balance by the static method.

It is an object of this invention to provide means for dynamically balancing these sections of cylinders while they are rotating and balancing, one at a time, the opposed ends of a section of a cylinder, so that it can be truly balanced throughout its length.

It is another object of this invention to provide an apparatus wherein a cylinder section has a special head member secured at each end thereof, having a shaft extending therefrom, and

these shafts are mounted in laterally slidable roller bearings, and one of these shafts is connected to a driving means by means of a special type of universal joint, so that rotation can be imparted to the cylinder section while it is mounted in the special bearings, so that the rotation of the cylinder can be reflected in lateral vibration of the cylinder together with a gauge or marking means for indicating on the shaft where the light points are in the periphery of each end of the cylinder section.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation, with parts broken away, showing a preferred embodiment of my invention;

Figure 2 is a top plan view of the right-hand portion of Figure 1;

Figure 3 is a longitudinal sectional view of the universal joint mechanisms, shown in elevation at the left-hand end of Figure 1;

Figure 4 is an enlarged detail view of one of the universal joints, showing part of the same in section;

Figure 5 is an elevational view taken along the line 5-5 in Figure 2, and showing one end of the apparatus;

Figure 6 is a vertical sectional view taken along the line 6-6 in Figure 5;

Figure 7 is an end elevation of one of the heads, or disc members which I affix to each end of the cylinder section;

Figure 8 is a view partly in longitudinal section and partly in elevation, and taken substantially along the line 8-8 in Figure 2.

Referring more specifically to the drawings, the numeral 10 indicates a base plate for a pair of trackways, said trackways being completed by a pair of angle members 11 and 12, which have their contiguous edges spaced apart from each other providing slots 13. It is on these trackways that a pair of bearing members are adapted to be adjustably mounted. These bearing members comprise a base portion 14 having a pair of wheels 15 and 16 at each end thereof which are adapted to run on the angle members 11. Slidably penetrating each end of the base portion 14 are two bolts 17 which slidably and loosely penetrate the slots 13 and have their lower headed portions disposed below the slots 13 with a suitable washer 20 disposed therearound to prevent the bolt heads from passing through the slots 13. A nut 22 is threadably secured on the upper end of each of

the bolts 17, so that when the bearing member has been adjusted to the right position along the trackway, the nuts 22 can be tightened to hold the bearing in adjusted position. The bearing has a pair of upstanding legs 25 and 26, and the upper portion of the base member 14 has on that portion disposed between the upstanding portions 25 and 26, a plate 27 which has the upper ends of bolts 28 and 29 loosely fitting therein, said bolts being threadably secured in the portion 14, so that by adjusting the bolts 28 and 29, the portion 27 can be leveled. This portion 27 has a pair of ribs 30 and 31 projecting from its upper surface, and a pair of raceways 32 and 33 in which suitable balls are mounted. Slidably mounted on the portion 27 is a block 35 having a notch 36 therein, and between the side walls of the block 35, there is rotatably mounted rollers 37 and 38 which are rotatably mounted on shafts 39 and 40. Secured on one of the posts 25 and 26 is a block 41 having a pair of notches 42 and 43 therein in which a pencil 44 is adapted to be positioned for purposes to be later described.

Adapted to rest on the rollers 37 and 38 in the right-hand bearing member as shown in Figure 1 is a shaft 50 which has fixedly secured thereon a disc 51 having a plurality of threaded bolts 52 secured therein and projecting outwardly. The shaft 50 is secured to the disc 51 by any suitable means such as a set screw 53. The threaded bolts 52 have heads 54 thereon, and suitable nuts 55 confine the bolts on the head or disc 51. The shaft 50 extends further inwardly into the cylinder 58 and penetrates a hub portion of a header disc 56 which is a conventional part of the cylinder section 58 and the hub portion 56 is secured to the shaft 50 by any suitable means such as a set screw 57. The cylinder 58 at each end has a flange portion 59, which flanges fit against like flanges on the next adjoining section of the cylinder when the sections of the cylinders are joined together to make one integral driving cylinder throughout a textile frame. The bearing member at the left-hand end of the cylinder, as shown in Figure 1, is identical to the one shown and described at the right-hand end, and like references will apply except that the shaft instead of being designated 50 is designated as 50a. The cylinder 58 at each end has holes 48 and 49 through which a wrench may be inserted for turning set screws 57. This shaft 50a has a cavity in the left-hand thereof in Figure 1 in which a connecting rod 60 is secured by any suitable means such as a set screw 61, and a member 62 is secured by means of set screw 63 to the left-hand end of connecting rod 60 in Figure 1. This member 62 is better illustrated in Figure 4, except that the showing in Figure 4 is in reversed position. The member 62 has a cavity 65 therein with a pair of slots 66 and 67 in which a pin 68 is loosely mounted, said pin penetrating a ball 69 on one end of a member 70, and threadably mounted on member 62 is a cylindrical member 71 which is secured in adjusted position by means of a set screw 72. This member 71 has a restricted end by means of an inturned flange 73 for confining the ball 69 in position. This gives entirely free and unlimited movement in one direction except that it is limited by the flange 73, and limited movement in the other direction which is limited by the amount of movement pin 68 can have in the slots 66 and 67.

The portion 70 penetrates a cavity in a connecting link 80, and is secured in position by means of a set screw 81, and in the other end of this connecting rod 80, there is secured by

means of a set screw 82 another member 70 which is reversed as to the position of that shown in Figure 3, but occupies the position shown in Figure 4. Another assembly of members 62 to 73 is shown at the extreme left-hand end of Figure 1, and is identical to the one previously described for the right-hand portion of the universal link assembly, and like reference characters will apply, the set screw 63 in this instance engaging one end of a connecting rod 85 which is a part of a shaft 86 which is rotatably mounted in a suitable bearing post 87 and is driven by any suitable means such as a pulley 88 having a belt, not shown, from a suitable prime mover mounted thereon.

In balancing a cylinder section, the heads 51 with the threaded bolts projecting therefrom are secured in position on each end of the cylinder section, and it is rotated from 800 to 2,000 R. P. M.'s, the preferable speed usually being around 1100 R. P. M. Previously to this, the pencil is placed in one of the notches 42 or 43 with its point not quite touching the shaft. While the section with the heads thereon is rotating at a speed above the critical speed, the pencil is gradually moved towards the shaft until the shaft touches the pencil. After the shaft has touched the pencil probably from 100 to 200 times, or once for each revolution, the cylinder is then stopped. Then the pencil is moved over into the other notch, and then the cylinder is rotated in the other direction, and the pencil is moved up until it can be felt that the shaft is touching the pencil. The cylinder is then stopped, and it is noted where the two pencil marks are on the shaft; while the cylinder is running in a counter-clockwise manner in Figure 2, mark A will be made, and when it is then reversed and runs in a clockwise direction in Figure 2, the mark B will be made by the pencil on the shaft. These marks are usually no longer in length than three-fourths of an inch. Then the half-way point between the outer ends of the pencil marks will be the point at which the cylinder is off balance, or this spot represents the light point in the cylinder. Suitable nuts or sleeves 90 made of solder are then screwed onto the bolts 52 at the point where the marks A and B indicate the light point on the cylinder. Suitable nuts made of solder are threaded onto the bolts until it is found that, with a given weight of one or more of these nuts made of solder effected either by interchanging the nuts of solder or by adding more than one nut, the pencil, while the cylinder is rotating in either direction, leaves a continuous circumferentially disposed mark on the shaft. Then these nuts made of solder, whether it be one nut or more than one, are transferred bodily to the inside of the cylinder through the hole to a point on the interior of the cylinder represented by the point mid-way of the ends of the pencil marks A and B, and they are melted and deposited as solder onto the interior of the cylinder. This operation is then repeated on the other end of the cylinder to balance the other end. When this is done, the balancing is checked at each end as above-described at about 2,000 R. P. M.'s, and of course, if there should be any off balance indicated, the process above-described would be repeated, but it usually shows a continuous pencil mark all the way around the shaft which indicates that the cylinder is dynamically balanced. These tubes of solder 90 have a hole therethrough of slightly smaller dimensions than the dimensions of the bolts 52, and different

lengths of solder tube are selected for screwing onto the bolts until one of suitable length has been found to dynamically balance the ends of the cylinder being tested.

Static balancing is practical on an object having very short longitudinal dimensions such as automobile wheels, heavy pulleys, or the like, but in an elongated object like a cylinder for spinning and twisting frames, spoolers, quillers, and the like, static balancing is not practical on account of the longitudinal length of the cylinders.

In the drawings and specification there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. Apparatus for dynamically balancing cylinders and other elongated objects which comprises a trackway, a pair of laterally slidable bearing members adjustably mounted along the trackway, a pair of head members each having a shaft fixedly secured therein and extending from each surface of the head members, each of said head members having a plurality of threaded bolt members extending outwardly therefrom, the shafts being adapted to be secured to the end portions of the cylinders, the other projecting portions of said shafts being adapted to be supported by said bearing members disposed on the trackway, a universal joint arrangement connected to the outer end of one of the shafts and having power driven means associated therewith for imparting rotation to the shaft and to the cylinder sections supported by the shafts, means for supporting a marking member for placing a

marking upon one of the shafts while the cylinder is rotating in one direction, and for supporting a marking member in another position for placing another mark on the shaft while the cylinder section and shafts are rotating in an opposite direction, said bolts being adapted to threadably receive weights at a position on the head members indicated by the markings on the shaft.

2. Apparatus for dynamically balancing an elongated object such as a cylinder section from a spinning frame, twisting frame, spooler, quiller, and the like, comprising a pair of circular head members each having a shaft projecting from each side thereof, the cylinder sections having hub members therein adapted to receive one end of each of said shafts, each of said circular head members having a plurality of threaded bolts extending outwardly therefrom for receiving weighted members for dynamically balancing the shafts, a pair of bearing stands adapted to rotatably receive the outwardly projecting ends of said shaft, each of said bearing stands having a laterally slidable bearing portion whereby vibration in the cylinder section while rotating will allow the laterally slidable bearing portions to move laterally of the bearing members, each of the bearing stands having a support for supporting a marking member to mark on the shaft an indication when the cylinder section and shafts are rotating in one direction, and also having a supporting portion for supporting a marking member for marking on the shaft at another position a marking when the cylinder is rotating in an opposite direction whereby the point of unbalance in the cylinder section may be determined by rotating the same in opposite directions.

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